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NEW SCORPIONS BELONGING TO THE
EUSTHENURA GROUP OF *VEJOVIS* FROM
BAJA CALIFORNIA, MEXICO
(SCORPIONIDA: VEJOVIDAE).

By

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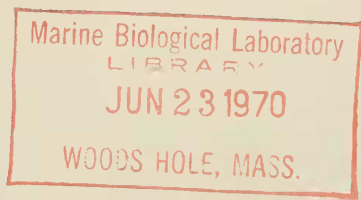
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ABSTRACT: Seven new species and subspecies of scorpions in the genus *Vejovis* are described and discussed. These new taxa belong to the *eusthenura* group of the genus. One of the new species, *Vejovis viscainensis* Williams, appears to represent a distinct systematic branch of this group.

INTRODUCTION

Recent biological exploration of the Baja California peninsula has resulted in the finding of much important information about the scorpion fauna of western North America. The species *Vejovis eusthenura* (Wood), which has caused much taxonomic confusion for many years, has now been collected in large numbers and defined in terms of morphology and zoogeographic distribution. In addition, three other new species closely related to *Vejovis eusthenura* have been described from Baja California: *Vejovis schwenkmeyeri* Williams, *Vejovis hoffmanni* Williams, and *Vejovis diazi* Williams. Since this more recent work, a whole group of related *Vejovis* scorpions has been discovered in Baja California, southern California, and Arizona. Seven of these are described and named in this paper. These findings have special importance in that the evolution and systematic relationships of those scorpions belonging to the genus we now call *Vejovis* are beginning to be understood.

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Scorpions of the "*eusthenura*" group of *Vejovis* are found in western North America with greatest species diversity in the Baja California peninsula and the desert country of southern California and Arizona. Most are uniform pale yellow in color and found in more or less sandy habitats. Most of the species are burrowers, some of which appear to be found on the ground surface only during a very restricted time of the year, presumably the mating season. Several of the species appear to have several sexually mature instars. Generally, members of this group may be recognized by the following characteristics: metasomal segment V distinctly longer than either carapace or movable finger; pedipalp fingers elongate, movable or fixed finger distinctly longer than underhand; palm narrow, with keels lowly developed to obsolete; dorsal and dorsolateral keels of metasoma well developed and coarsely crenulate to serrate; inferior lateral keels of metasoma present, these smooth, crenulate or intermediate; carapace and tergites densely granular; chelicerae with inferior border of movable finger lacking denticles; carapace anterior margin with subtle median emargination to essentially straight; lateral eyes small, three per group; pectines well developed, teeth numbering about 13 to 22; females' pectines smaller and with fewer teeth than those of male; adult males with distinct genital papillae, and completely divided genital operculum; females lacking genital papillae, genital operculum not completely divided longitudinally.

The species of the "*eusthenura*" group are very similar in basic morphology and coloration. The following characteristics, however, appear to be sensitive indicators of speciation and are, therefore, considered good diagnostic characteristics: elongation of the pedipalp fingers; reduction of palm width; size and structure of proximal scallop of pedipalp fingers when chela closed; open space remaining between pedipalp fingers when chela closed; hirsuteness of vesicle, especially of mature males; surface texture of vesicle; structure of inferior median and inferior lateral keels of metasoma; ratio of length to width of metasomal segment I; setation of anterior margin of carapace.

The measurements used in this paper are essentially the standard ones in current scorpion systematics with minor modification (Williams, 1968a). Most of the specimens studied were collected by the ultraviolet detection method (Williams, 1968b), on two expeditions through the Baja California peninsula during 1968 and 1969. During these two expeditions, some 50,000 scorpions were collected including several thousand belonging to the "*eusthenura*" group. These specimens were killed, preserved, and processed by the methods recently recommended by Williams (1968c).

ACKNOWLEDGMENTS

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NEW SPECIES

Vejovis waeringi Williams, new species.

(Figures 1, 2.)

DIAGNOSIS. Relatively large, uniform pale yellow species of the "*custhenura*" group of *Vejovis*. Closely related to *Vejovis schwenkmeyeri* Williams and *Vejovis coloradensis* Williams by the essentially bald and conspicuously tubercular vesicle of the male. Differs from *V. schwenkmeyeri* in the following ways: lack of conspicuous pedipalp scallop; the presence of more elongate pedipalp fingers; metasoma with inferior median keels smooth to crenulate on segments I to III, crenulate on IV; metasoma with inferior lateral keels crenulate (not essentially smooth with a few crenulations). More closely related to *V. coloradensis* from which it differs in the following characteristics: females with vesicle conspicuously hirsute (not approaching inconspicuous hirsuteness to baldness); females with dorsal keels of metasomal segments IV and V conspicuously hirsute; inferior median keels of metasoma more smooth than crenulate (not definitely crenulate); movable finger of pedipalp approximates carapace length (not distinctly longer than carapace).

DESCRIPTION OF HOLOTYPE (male). Coloration: Entire body uniform pale yellow, pectines whitish; no distinctive contrasting markings.

Carapace: Anterior margin essentially straight, with very subtle median emargination; anterior margin set with about three or four pairs inconspicuous reddish bristles; entire surface densely granular.

Mesosoma: Tergites densely granular; 7th tergite with two pairs well developed serrate keels. Sternite 7 with one pair crenulate lateral keels. Stigma long oval.

Metasoma: Inferior lateral keels crenulate on segments I to IV. Inferior median keels smooth on segment I, smooth with several crenulations on II,

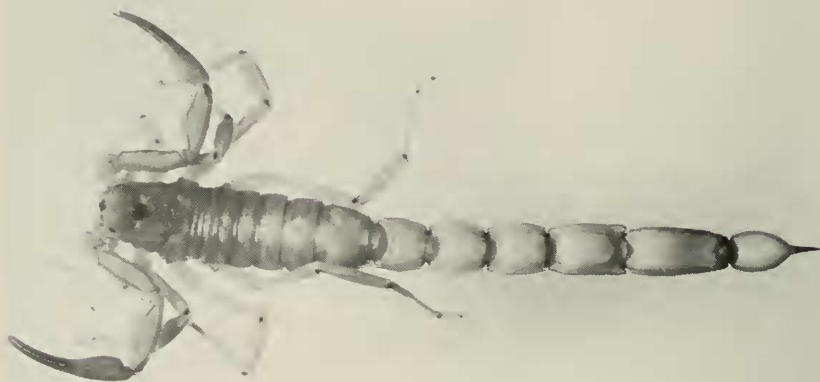


FIGURE 1. *Vejovis waeringi* Williams, new species. Dorsal view of holotype male.

smooth to crenulate on III, irregularly crenulate on IV. Segment I wider than long.

Telson: Ventral surface with numerous short inconspicuous hairs, not appearing hirsute. Ventral surface conspicuously tubercular. Vesicle more than twice aculeus length.

Pedipalps: Chela long and slender. Keels low and inconspicuous with low, rounded granules. Fingers with long shallow proximal scallop; fingers touch only at distal ends when chela closed leaving long open space. Movable finger shorter than metasomal segment IV, movable finger equal to carapace in length, longer than brachium. Fixed finger longer than metasomal segment III.

Standard measurements and photographs: Table 1 and figures 1 and 2.

DESCRIPTION OF ALLOTYPE (female). Morphologically the same as holotype with the following exceptions: larger in total length; ventral surface of vesicle abundantly covered with long conspicuous hairs; pectines smaller, with fewer teeth; keels on pedipalp hand obsolescent; tarsomeres with long conspicuous hairs on posterior side; vesicle more swollen; dorsal keels of metasomal segments IV and V set abundantly with long hairs; inferior median and inferior lateral keels of metasoma set with several long conspicuous hairs.

Standard measurements: Table 1.



FIGURE 2. *Vejovis waeringi* Williams, new species. Ventral view of holotype male.

VARIATION WITHIN PARATYPES. Study of 233 paratopotypes (179 males, 54 females) indicated little variation from the descriptions of the holotype and allotype. Males varied in total length from 32 to 47 millimeters while females varied from 30 to 58 millimeters. Most specimens of both sexes appeared to be mature. Females tended to be larger than males in most body proportions. Pectine teeth varied from 12 to 14 in females and from 15 to 18 in males (based on 20 males, 20 females). The holotype and allotype appear typical of the paratopotype sample.

TYPE DATA AND ETYMOLOGY. The holotype, allotype, and 233 paratopotypes were collected at Okies Landing, 27 miles south of Puertocitos, Baja California Norte, Mexico, 12 June 1968, by S. C. Williams, M. A. Cazier, and party. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "*waeringi*" after Erik Kjellsvig-Waering, because of his contributions toward the understanding of the evolution and paleontology of scorpions, and because of his recent contributions toward defining the scorpion fauna of the West Indies.

DISTRIBUTION. Known only from the upper gulf region of Baja California, Norte, Mexico, from the Rio Hardy Fishing Camp south to Okies Landing, and east of the Sierra San Pedro Martirs and Sierra Juarez.

TABLE 1. *Measurements (in millimeters) of Vejovis waeringi Williams, new species, holotype and allotype.*

	<i>holotype</i> (<i>male</i>)	<i>allotype</i> (<i>female</i>)
Total length	46.0	54.0
Carapace, length	5.6	6.7
width (at median eyes)	4.0	4.6
Metasoma, length	22.6	23.1
segment I (length/width)	3.2/3.4	3.3/3.8
segment II (length/width)	3.7/3.4	3.7/3.7
segment III (length/width)	3.8/3.3	4.1/3.7
segment IV (length/width)	5.2/3.4	5.2/3.8
segment V (length/width)	6.7/3.2	6.8/3.8
Telson, length	6.2	7.3
Vesicle (length/width)	4.3/2.7	5.1/3.4
depth	2.1	2.8
Aculeus, length	1.9	2.2
Pedipalp		
Humerus (length/width)	4.9/1.4	5.4/1.5
Brachium (length/width)	5.2/1.7	5.7/2.1
Chela (length/width)	8.1/1.4	9.2/2.0
depth	1.7	2.2
movable finger, length	5.6	6.5
fixed finger, length	4.6	5.0
Pectines		
teeth (left/right)	15/16	13/13

RECORDS. In addition to the holotype, allotype, and 233 paratopotypes, 53 other paratypes, all from Baja California Norte, Mexico, were available for study: San Felipe, elevation 25 feet, 8 June 1968 (S. C. Williams, M. A. Cazier, and party), 12 males, 4 females; San Felipe, elevation 25 feet, 9 June 1968 (S. C. Williams, M. A. Cazier, and party), 10 males, 3 females; Puertecitos, elevation 25 feet, 10 June 1968 (S. C. Williams, M. A. Cazier, and party), 6 males, 2 females; Puertecitos, elevation 25 feet, 11 June 1968 (S. C. Williams, M. A. Cazier, and party), 9 males, 5 females; 4 miles west of Rio Hardy Fishing Camp, elevation 100 feet, 19 July 1969 (S. C. Williams, and V. F. Lee), 2 females.

COMMENT. The conspicuous sex ratios, significantly in favor of the males, indicate that this species must have a predominantly subsurface living habit, even at night. The conspicuous male surface activity was probably due to courtship surface migrations.

Vejovis coloradensis Williams, new species.

(Figures 3, 4.)

DIAGNOSIS. Large uniform pale yellow species of the eusthenura group of *Vejovis*. Distinctive characteristics include: movable finger distinctly longer than carapace; metasomal segment I wider than long; no pedipalp scallop; male vesicle appearing essentially bald and conspicuously tubercular, female only slightly more hirsute; related to *Vejovis waeringi* Williams and *Vejovis confusus* Stahnke. Differs from *V. confusus* in the following ways: chela more elongate and slender; males with palm of chela distinctly less than two times width of movable finger base, females with palm width two times movable finger base width (palm proportionally wider in *V. confusus*); males with vesicle more laterally swollen and more conspicuously tubercular; females with a few long conspicuous hairs on vesicle but not conspicuously hirsute; movable finger distinctly longer than carapace. Differs from *V. waeringi* in the following ways: females with vesicle not conspicuously hirsute; females with dorsal keels of metasomal segments IV and V not conspicuously hirsute; inferior median keels of metasoma definitely crenulate (not more smooth than crenulate); movable finger of pedipalp definitely longer than carapace (not approximating carapace length).

DESCRIPTION OF HOLOTYPE (male). Coloration: Body uniform pale yellow; pectines whitish; pedipalp finger slightly darker yellow.

Carapace: Anterior margin with slight median emargination, this border with three pairs of short stout hairs; entire surface coarsely granular.

Mesosoma: Tergites densely granular; 7th tergite with two pairs of serrate lateral keels; 7th sternite with one pair of serrate lateral keels; stigma small, long-oval.

Metasoma: Inferior lateral keels crenulate to serrate; inferior median keels crenulate; segment I definitely wider than long.

Telson: Ventral surface laterally swollen and conspicuously covered with large rounded tubercles, this surface with about three pairs of relatively long but inconspicuous hairs (vesicle definitely not hirsute in appearance); aculeus short, $\frac{1}{2}$ vesicle in length.

Pedipalps: Long and slender; palm width 1.5 times width of movable finger base; movable finger longer than carapace; palm with inconspicuous keels, these smooth to faintly crenulate.

Standard measurements and photographs: Table 2 and figures 3 and 4.

DESCRIPTION OF ALLOTYPE (female). The same as holotype in coloration and structure with the following exceptions: considerably longer in body length; pectines with fewer teeth; palms slightly more swollen; palm twice as wide as base of movable finger; vesicle venter with about seven or eight pairs of long hairs

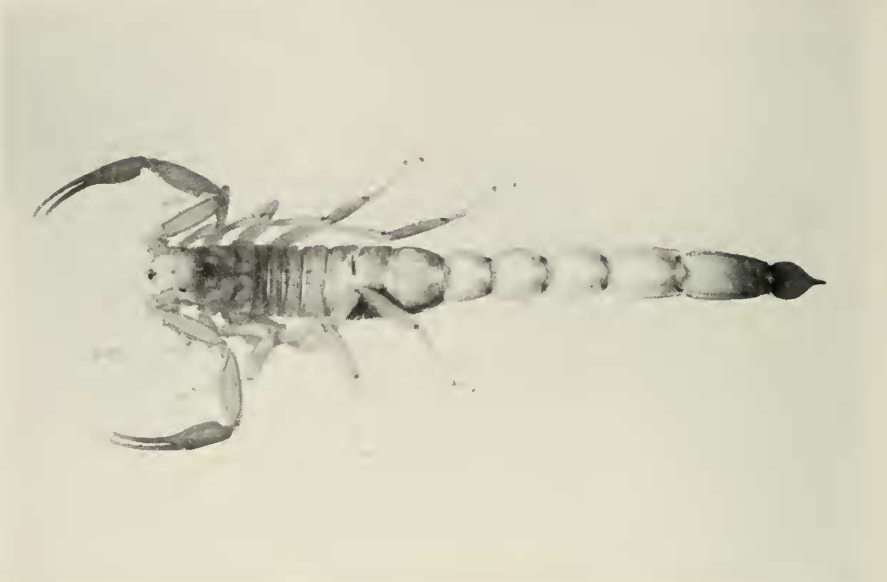


FIGURE 3. *Vejovis coloradensis* Williams, new species. Dorsal view of holotype male.

(vesicle still not hirsute in appearance); hairs on anterior border of carapace longer.

Standard measurements: Table 2.

TYPE DATA AND ETYMOLOGY. The holotype, allotype and one male paratopotype were collected at the California Agricultural Inspection Station, 2 miles west of Andrade, Imperial County, California, 6 July 1969 by S. C. Williams and V. F. Lee. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "*coloradensis*" because of its distribution in the Colorado Desert of North America.

DISTRIBUTION. This species is found in the Imperial Valley of the Colorado Desert in southern California and in northern Baja California, Mexico. It was found in open sandy habitats but was not abundant in the samples taken.

RECORDS. In addition to the holotype, allotype, and one male paratopotype, 12 other paratypes were available for study: California (U. S. A.), Imperial County: Glamis, 14 October 1967 (M. A. Cazier, J. Bigelow, and S. Gorodenski), 2 males; 19 miles west of Calexico, 6 July 1969 (S. C. Williams and V. F. Lee), 2 males; 10 miles east of Calexico, 6 July 1969 (S. C. Williams and V. F. Lee), 2 males. Mexico, Baja California Norte: 2 miles south of Algodones, 18 July 1969 (S. C. Williams and V. F. Lee), 2 males, 1 female; Algodones, 18 July 1969 (S. C. Williams and V. F. Lee), 3 males.

TABLE 2. *Measurements (in millimeters) of Vejovis coloradensis Williams, new species, holotype and allotype.*

	<i>holotype</i> (<i>male</i>)	<i>allotype</i> (<i>female</i>)
Total length	46.0	52.0
Carapace, length	5.2	5.8
width (at median eyes)	3.7	4.3
Metasoma, length	20.2	21.2
segment I (length/width)	2.8/3.2	2.8/3.4
segment II (length/width)	3.4/3.2	3.3/3.3
segment III (length/width)	3.7/3.3	3.6/3.3
segment IV (length/width)	4.8/3.3	4.8/3.4
segment V (length/width)	5.5/3.3	6.7/3.4
Telson, length	5.8	6.7
Vesicle (length/width)	4.2/2.6	4.6/3.0
depth	1.8	2.4
Aculeus, length	1.6	2.1
Pedipalp		
Humerus (length/width)	4.8/1.3	5.2/1.4
Brachium (length/width)	5.2/1.5	5.7/1.9
Chela (length/width)	8.3/1.4	9.2/1.9
depth	1.5	2.1
movable finger, length	5.6	6.4
fixed finger, length	4.6	5.3
Pectines		
teeth (left/right)	18/18	14/14

Vejovis terradomus Williams, new species.

(Figures 5, 6.)

DIAGNOSIS. Medium sized species of the eusthenura group of *Vejovis*. Base color yellow with light dusky markings on dorsum of carapace and mesosoma; pedipalp fingers of medium length; males with vesicle bald and tubercular; pedipalp fingers of adult male with proximal scallop. Closely related to *Vejovis galbus* Williams and *Vejovis schwenkmeyeri* Williams by the bald, conspicuously tubercular male vesicle and hirsute female vesicle. Differs from *V. schwenkmeyeri* by the following characteristics: distinctly smaller body size; completely crenulate inferior lateral keels of metasoma; pedipalp fingers proportionally slightly longer. Differs from *V. galbus* in the following characters: somewhat larger species; metasoma with segment I slightly longer than wide (not slightly wider than long); pedipalp fingers proportionally longer, movable finger slightly longer than carapace (not shorter); pedipalp fingers with distinct scallop (scallop

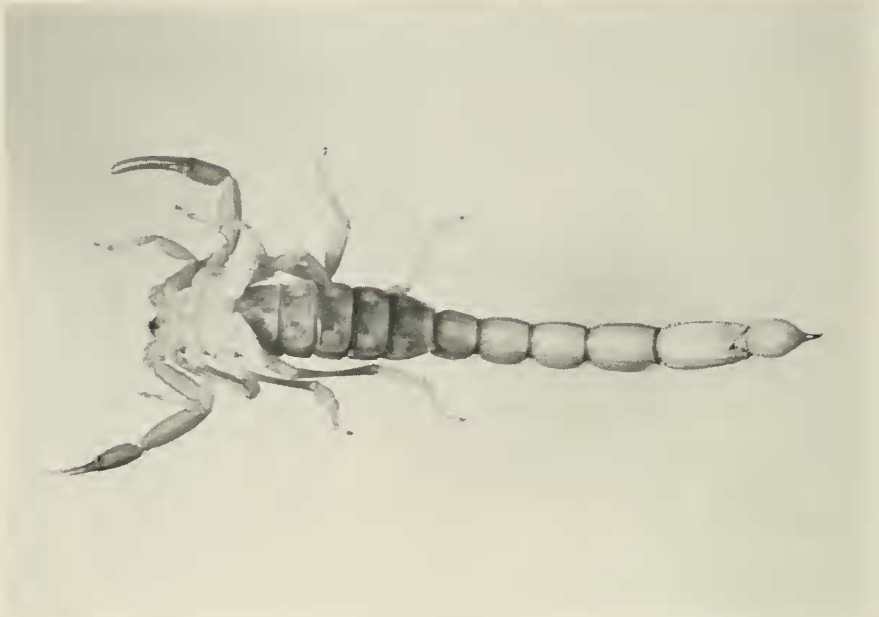


FIGURE 4. *Vejovis coloradensis* Williams, new species. Ventral view of holotype male.

not obsolescent); males with movable pedipalp finger twice as long as underhand (not 1.5 times as long as underhand).

DESCRIPTION OF HOLOTYPE (male). *Coloration:* Base color of body pale yellow; carapace and mesosomal dorsum with irregular dusky underlying markings, tergites terminate with posterior black seam; pedipalp fingers light orange; pectines whitish.

Carapace: Anterior margin straight, set with six erect hairs; entire surface densely granular.

Mesosoma: Tergites densely granular; tergite of segment 7 with two pairs of well developed and serrate lateral keels; 7th sternite with one pair of crenulate lateral keels; stigma long oval.

Metasoma: Inferior lateral keels distinctly crenulate on segments I to V; inferior median keels smooth on segments I and II, smooth to lightly crenulate on III and IV; segment I longer than wide; segment V longer than telson.

Telson: Ventral surface of vesicle with a number of very short inconspicuous hairs, not hirsute in appearance; venter of vesicle densely covered with rounded tubercules; vesicle twice aculeus length.

Pedipalps: Fingers of chela with proximal scallop; fingers touch only at distal ends when chela closed, leaving elongate open space; palm with keels obsolete; movable finger shorter than metasomal segment V but longer than carapace.

TABLE 3. *Measurements (in millimeters) of* *Vejovis terradomus Williams, new species, holotype.*

	<i>holotype</i> <i>(male)</i>
Total length	44.0
Carapace, length	4.9
width (at median eyes)	3.5
Metasoma, length	21.3
segment I (length/width)	2.9/2.7
segment II (length/width)	3.5/2.7
segment III (length/width)	3.7/2.6
segment IV (length/width)	4.7/2.5
segment V (length/width)	6.5/2.4
Telson, length	5.9
Vesicle (length/width)	4.1/2.0
depth	1.6
Aculeus, length	1.8
Pedipalp	
Humerus (length/width)	4.4/1.3
Brachium (length/width)	4.6/1.6
Chela (length/width)	7.7/1.8
depth	1.9
movable finger, length	5.1
fixed finger, length	4.0
Pectines	
teeth (left/right)	19/19

Standard measurements and photographs: Table 3 and figures 5 and 6.

VARIATION WITHIN PARATYPES. Study of nine paratopotypes (6 males, 3 females) indicated little significant variation from holotype in color and structure. An allotype was not erected because doubt existed whether any of the females were mature. Males varied in total body length from 33 to 41 millimeters, females varied from 23 to 35 millimeters. Pectine tooth counts varied from 14 to 15 in females, and from 18 to 19 in males.

TYPE DATA AND ETYMOLOGY. The holotype and nine paratopotypes were collected 1 mile southwest of Rancho Canipolé, Baja California Sur, Mexico on 15 May 1969 by S. C. Williams. The holotype is permanently deposited in the California Academy of Sciences.

This species is named "*terradomus*" which means soil dweller.

DISTRIBUTION. This species is known only from the limited distribution between Rancho Canipolé and Loreto, Baja California Sur, Mexico.

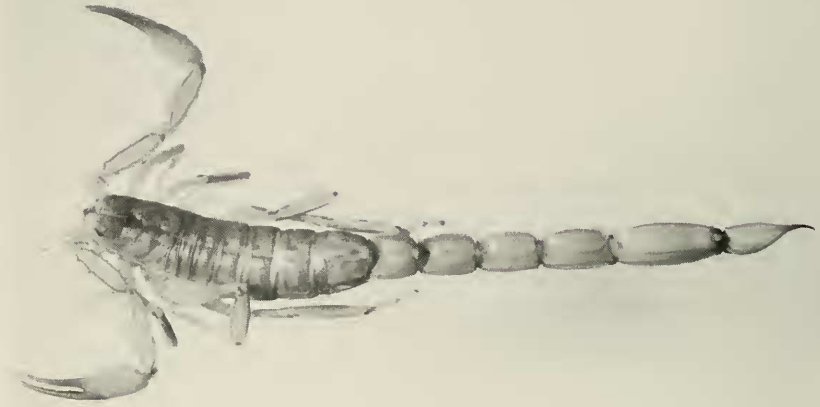


FIGURE 5. *Vejovis terradomus* Williams, new species. Dorsal view of holotype male.



FIGURE 6. *Vejovis terradomus* Williams, new species. Ventral view of holotype male.

RECORDS. Mexico, Baja California Sur: 5 miles south of Loreto, elevation 100 feet, 16 May 1969 (S. C. Williams), 7 males, 3 females; 1 mile south of Loreto, elevation 25 feet, 17 May 1969 (S. C. Williams), 1 male, 3 females.

COMMENT. The sizes and sex ratios of the samples indicate that this species probably spends most of its diurnal and nocturnal life inside more or less permanent burrows. Surface activity may be limited to courtship and mating seasons and then would be expected to be predominantly that of sexually mature males.

Vejovis galbus Williams, new species.

(Figures 7, 8.)

DIAGNOSIS. Medium sized, pale yellow species of *Vejovis* belonging to the "eusthenura" group. Metasomal segments I to IV with inferior lateral keels more smooth than crenulate; inferior median keels smooth to obsolete; male vesicle bald and tubercular, female vesicle hirsute; pedipalp fingers relatively short for eusthenura group, movable finger distinctly shorter than carapace and only 1.5 times longer than underhand; pedipalp fingers with scallop obsolescent, male fingers appearing much like that of female. Somewhat related to *Vejovis terradomus* Williams from which it differs in the following characteristics: smaller body size; pedipalp fingers with obsolescent scallop; pedipalp fingers considerably shorter in proportion.

DESCRIPTION OF HOLOTYPE (male). *Coloration*: Dorsum pale yellow with faint underlying dusky markings on carapace and mesosoma; pectines whitish; walking legs whitish yellow with faint dusky marking on femur and patella.

Carapace: Anterior border essentially straight but with subtle median emargination; six inconspicuous hairs; carapace surface densely granular; lateral eyes three per group.

Mesosoma: Tergites densely granular; last tergite with two pairs of serrate lateral keels; last sternite with one pair of lateral keels, these smooth to subtly crenulate; stigma small, long oval.

Metasoma: Inferior lateral keels smooth to irregularly crenulate on segments I to IV; inferior median keels smooth to obsolete on segments I to IV; segment I slightly wider than long; segment III longer than fixed finger; segment IV slightly longer than movable finger.

Telson: Vesicle with a few short inconspicuous hairs ventrally, appearing bald and densely tubercular; subtle subaculear tubercule; vesicle more than twice aculeus length; vesicle distinctly narrower than metasomal segments.

Pedipalps: Chela long and slender; palm with keels obsolescent; fingers with obsolescent scallop; narrow but distinct space between proximal $\frac{2}{3}$ of fingers when chela closed; movable finger distinctly shorter than either carapace or metasomal segment V.

Standard measurements and photographs: Table 4 and figures 7 and 8.



FIGURE 7. *Vejovis galbus* Williams, new species. Dorsal view of holotype male.



FIGURE 8. *Vejovis galbus* Williams, new species. Ventral view of holotype male.

TABLE 4. *Measurements (in millimeters) of Vejovis galbus Williams, new species, holotype and allotype.*

	<i>holotype</i> (male)	<i>allotype</i> (female)
Total length	34.0	38.0
Carapace, length	4.3	4.9
width (at median eyes)	3.0	3.7
Metasoma, length	16.5	16.6
segment I (length/width)	2.3/2.4	2.3/2.6
segment II (length/width)	2.7/2.4	2.7/2.6
segment III (length/width)	2.8/2.4	2.8/2.5
segment IV (length/width)	3.6/2.3	3.6/2.5
segment V (length/width)	5.1/2.4	5.2/2.5
Telson, length	4.6	5.2
Vesicle (length/width)	3.2/1.9	3.5/2.3
depth	1.5	1.8
Aculeus, length	1.4	1.7
Pedipalp		
Humerus (length/width)	3.4/1.1	3.7/1.2
Brachium (length/width)	3.7/1.3	4.2/1.6
Chela (length/width)	5.7/1.4	6.3/1.8
depth	1.6	2.1
movable finger, length	3.4	3.8
fixed finger, length	2.5	2.7
Pectines		
teeth (left/right)	17/18	11/11

DESCRIPTION OF ALLOTYPE (female). Essentially the same as holotype in color and morphology with the following exceptions: body size larger; hairs on patella and tarsomeres of walking legs longer; inferior lateral keels of metasoma more crenulate; dorsal keels of metasomal segments IV and V with several long conspicuous hairs (hairs lacking in holotype); vesicle set with abundant long conspicuous hairs ventrally; metasoma proportionally broader, segment I much wider than long, segment II slightly longer than wide; metasomal segment V approximates telson in length; pectines smaller, with fewer teeth.

Standard measurements: Table 4.

VARIATION WITHIN PARATYPES. Study of 18 paratopotypes (9 males, 9 females) indicated little variation from the description of holotype and allotype. Males varied in total length from 18 to 35 millimeters, females varied from 19 to 37 millimeters. Pectine tooth counts varied from 12 to 15 in females and from 16 to 18 in males. Younger instars have dusky dorsal pigmentation more distinct.

TYPE DATA AND ETYMOLOGY. The holotype, allotype and 18 paratopotypes were collected 5 miles south of Loreto, Baja California Sur, Mexico, on 16 May 1969 by S. C. Williams. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "*galbus*" because of its more or less uniform yellow coloration.

RECORDS. Known only from holotype, allotype, and paratopotype location.

Vejovis viscainensis Williams, new species.

(Figures 9, 10.)

DIAGNOSIS. Medium to large pale yellow species of *Vejovis* generally related to scorpions of the "*eusthenura*" group but differing by the very fine crenulation of the dorsal, dorso-lateral, and inferior lateral keels of the metasoma. Diagnostic characteristics are: male and female with vesicle not conspicuously hirsute; vesicle distinctly elongate, this more so in male; aculeus elongate and well curved; movable finger of pedipalp longer than carapace; pedipalp with hand very elongate and narrow; metasoma with inferior lateral keels very finely crenulate along entire length; each dorsal keel of segment II with about 25 to 30 fine crenulations (about half this number in other members of the *eusthenura* group); fingers of pedipalp lacking scallop, fingers meet only at distal ends when chela closed.

Is somewhat related to *Vejovis schwenkmeyeri* Williams and *Vejovis diazi* Williams but differs by having more elongate pedipalp fingers and a lack of scallop on fingers.

DESCRIPTION OF HOLOTYPE (male). *Coloration*: Entire body pale yellow; carapace and mesosomal tergites with very faint dusky underlying pigmentation; some dusky pigmentation concentrated in interocular area; pectines whitish.

Carapace: Essentially straight but with subtle median emargination; anterior border set with two pairs short inconspicuous bristles; entire surface densely granular.

Mesosoma: Tergites densely granular; tergite 7 with two pairs of finely serrate keels; sternite 7 with one pair crenulate keels; stigma long oval.

Metasoma: Dorsal and dorso-lateral keels very finely serrate; serrations irregular; inferior lateral keels finely crenulate on segments I to IV; inferior median keels smooth on segments I and II, smooth to finely crenulate on III, finely crenulate on IV; inferior median and inferior lateral keels of segment V low and very finely crenulate; segment I slightly longer than broad.

Telson: Long and slender, ventral surface with a number of short inconspicuous hairs, vesicle generally not appearing hirsute; ventral surface finely tubercular with broad subaculear tubercule; vesicle about three times aculeus in length.



FIGURE 9. *Vejovis viscainensis* Williams, new species. Dorsal view of holotype male.

Pedipalps: Chela long and slender, palm not swollen; fingers not scalloped; movable finger more than twice underhand length; small proximal space between fingers when chela closed; keels on palm smooth to obsolete; movable finger slightly longer than brachium.

Standard measurements and photographs: Table 5 and figures 9 and 10.

DESCRIPTION OF ALLOTYPE (female). Morphologically the same as holotype with the following exceptions: larger in total body size; pectines smaller and with fewer teeth; inferior median keels smooth to obsolete on segment I, smooth on II; ventral surface of vesicle with about five pairs of moderately conspicuous hairs, vesicle still does not appear distinctly hirsute; aculeus distinctly more elongate; vesicle more swollen; keels on palm obsolete.

Standard measurements: Table 5.

VARIATION WITHIN PARATYPES. Study of nine paratopotypes (five males, four females) indicated little significant variation from the description of holotype. Males varied in total length from 28 to 42 millimeters, females varied from 27 to 39 millimeters. Because of some doubt about the maturity of the females, the allotype was selected from another location. Pectine tooth counts varied from 16 to 17 in males and from 14 to 15 in females.

TYPE DATA AND ETYMOLOGY. The holotype and nine paratopotypes were collected 2 miles northwest of Miller's Landing, Baja California Norte, Mexico,



FIGURE 10. *Vejovis viscainensis* Williams, new species. Ventral view of holotype male.

21 June 1968, by S. C. Williams, M. A. Cazier, and party. The allotype was collected 14 miles south of Guerrero Negro, Baja California Sur, Mexico, 16 April 1969, by S. C. Williams. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "*viscainensis*" because it appears widely distributed through, and endemic to the Viscaino Desert of Baja California.

DISTRIBUTION. Viscaino Desert of Baja California from 2 miles northwest of Miller's Landing, Baja California Norte to San Angel, 13 miles west of San Ignacio, Baja California Sur, Mexico.

RECORDS. Mexico, Baja California Sur: San Angel, 13 miles west of San Ignacio, elevation 500 feet, 27 June 1968 (S. C. Williams, M. A. Cazier, and party), 4 males, 5 females; San Angel, 13 miles west of San Ignacio, elevation 500 feet, 28 June 1968 (S. C. Williams, M. A. Cazier, and party), 1 male, 1 female; 1 mile east of Las Bombas, elevation 100 feet, 16 April 1969 (S. C. Williams), 20 males, 10 females; 2 miles east of Las Bombas, elevation 100 feet, 16 April 1969 (S. C. Williams), 8 males, 13 females.

COMMENT. This species is apparently restricted to the sandy habitats of the Viscaino Desert to which it appears endemic. The low frequency of encounter in the samples taken on the ground surface at night combined with the significant predominance of males in some of the samples indicate this species to spend most of its life underground in burrows. This species is of systematic interest because it appears to represent a distinct branch from the eusthenura group of *Vejovis*.

TABLE 5. Measurements (in millimeters) of *Vejovis viscainensis* Williams, new species, holotype and allotype.

	holotype (male)	allotype (female)
Total length	44.0	49.0
Carapace, length	5.2	5.6
width (at median eyes)	3.6	3.8
Metasoma, length	21.6	22.1
segment I (length/width)	3.0/2.8	3.0/2.9
segment II (length/width)	3.4/2.6	3.6/2.8
segment III (length/width)	3.7/2.6	3.8/2.7
segment IV (length/width)	4.8/2.5	4.9/2.6
segment V (length/width)	6.7/2.4	6.8/2.4
Telson, length	6.0	6.4
Vesicle (length/width)	4.3/1.8	4.1/2.2
depth	1.5	1.8
Aculeus, length	1.7	2.3
Pedipalp		
Humerus (length/width)	4.6/1.2	5.0/1.5
Brachium (length/width)	5.0/1.6	5.6/1.9
Chela (length/width)	7.4/1.2	8.2/1.4
depth	1.4	1.6
movable finger, length	5.2	5.9
fixed finger, length	4.2	4.8
Pectines		
teeth (left/right)	16/15	14/14

***Vejovis hoffmanni fuscus* Williams, new subspecies.**

DIAGNOSIS. Related to *Vejovis hoffmanni hoffmanni* Williams in body size and basic morphology, especially in pedipalp and telson structure, but readily distinguished by the following characteristics: carapace and dorsum conspicuously marked with dusky coloration; telson with more hairs on vesicle; inferior lateral keels of metasoma with tendency to be more crenulate than smooth (not more smooth than crenulate).

DESCRIPTION OF HOLOTYPE (male). *Coloration*: Base color of cuticle light yellow; dorsum of carapace and mesosoma with dark dusky underlying markings, these somewhat marbled; dorsal intercarinal spaces of metasoma with faint dusky markings; vesicle light orange; walking legs with femur and patella with irregular dusky markings; pedipalps with light dusky markings; pectines whitish; inferior median keels of metasoma with faint dusky outline on segments III and IV.

Carapace: Anterior margin essentially straight; entire surface densely granular.

TABLE 6. *Measurements (in millimeters) of Vejovis hoffmanni fuscus Williams, new subspecies, holotype and allotype.*

	<i>holotype</i> (male)	<i>allotype</i> (female)
Total length	34.0	31.0
Carapace, length	4.1	4.0
width (at median eyes)	3.0	3.0
Metasoma, length	15.9	13.5
segment I (length/width)	2.1/2.4	1.8/2.0
segment II (length/width)	2.6/2.3	2.1/2.0
segment III (length/width)	2.8/2.3	2.2/1.9
segment IV (length/width)	3.5/2.2	3.0/1.9
segment V (length/width)	4.9/2.3	4.4/1.9
Telson, length	4.5	4.2
Vesicle (length/width)	2.9/1.6	2.7/1.6
depth	1.2	1.2
Aculeus, length	1.6	1.5
Pedipalp		
Humerus (length/width)	3.4/1.0	3.1/1.0
Brachium (length/width)	3.8/1.4	3.6/1.2
Chela (length/width)	6.0/1.5	5.4/1.2
depth	1.6	1.3
movable finger, length	3.6	3.5
fixed finger, length	2.7	2.6
Pectines		
teeth (left/right)	20/18	16/17

Mesosoma: Tergites densely granulate; last tergite with two pairs of serrate lateral keels; last sternite with one pair of lightly crenulate keels; stigma small, long oval.

Metasoma: Inferior lateral keels lightly and irregularly crenulate; inferior median keels obsolete; segment I wider than long; segment IV shorter than carapace; dorsal keels of segments IV and V with long conspicuous hairs.

Telson: Ventral surface of vesicle with obsolescent tubercles also abundantly covered with long conspicuous hairs; several long hairs on dorsum of vesicle at base of aculeus; vesicle almost twice aculeus length; vesicle narrower than either caudal segments or pedipalp palm.

Pedipalps: Fingers of chela with large proximal scallop; narrow open space between proximal $\frac{3}{4}$ of fingers when chela closed; keels lacking on palm; movable finger slightly shorter than brachium and slightly longer than metasomal segment IV.

Standard measurements: Table 6.

DESCRIPTION OF ALLOTYPE (female). Essentially the same as holotype in color and structure with the following exceptions: slightly smaller in body size; inferior median keels of metasoma smooth to slightly crenulate; no scallop in pedipalp fingers; pectines smaller and with fewer teeth.

Standard measurements: Table 6.

VARIATION WITHIN PARATYPES. Study of 12 paratopotypes (10 males, 2 females) indicated little variation from holotype and allotype. Males varied in total body length from 12 to 36 millimeters while females were 22 millimeters. Pectine tooth counts were 15 in females, and varied from 18 to 21 in males. Most of the specimens appeared to be subadults. Younger instars usually were more darkly pigmented than older ones, especially the terminal metasomal segment, and lacked the scalloped pedipalp fingers of the mature males.

TYPE DATA AND ETYMOLOGY. The holotype, allotype, and 12 paratopotypes were collected 24 miles northeast of San José de Comondú, Baja California Sur, Mexico, 15 May 1969 by S. C. Williams. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This subspecies is named "*fuscus*" because of its distinctive dark dorsal pigmentation.

DISTRIBUTION. Found only in the volcanic area of Comondú, Baja California Sur, Mexico.

RECORDS. Mexico, Baja California Sur: 21 miles south of San Miguel de Comondú, elevation 500 feet, 14 May 1969 (S. C. Williams), 1 male, 2 females; 21 miles south of San Miguel de Comondú, elevation 500 feet, 15 May 1969 (S. C. Williams), 2 males.

COMMENT. This subspecies appears to represent an invasion of *V. hoffmanni*, a predominantly sandy desert species, into the volcanic canyon bottoms and oases regions of the peninsula. Considerable isolation within the subspecies appears to occur as evidenced by apparent local color race formation in each of the known localities.

***Vejovis diazi transmontanus* Williams, new subspecies.**

DIAGNOSIS. Essentially the same as *Vejovis diazi diazi* Williams in structure and size but readily recognized by lack of red coloration to the vesicle, vesicle similar to metasoma in color.

DESCRIPTION OF HOLOTYPE (male). *Coloration:* Base color of body and appendages more or less uniform pale yellow; pedipalp fingers light orange-yellow; obsolescent dusky marking on carapace near median eyes; pectines whitish.

Carapace: Anterior margin straight, set with three pairs of long reddish hairs; entire surface densely granular.

Mesosoma: Tergites densely granular; last tergite with two pairs of serrate

TABLE 7. *Measurements (in millimeters) of Vejovis diazi transmontanus Williams, new subspecies, holotype.*

	<i>holotype</i> (<i>male</i>)
Total length	39.0
Carapace, length	4.9
width (at median eyes)	3.7
Metasoma, length	19.2
segment I (length/width)	2.6/2.8
segment II (length/width)	2.9/2.7
segment III (length/width)	3.4/2.7
segment IV (length/width)	4.3/2.6
segment V (length/width)	6.0/2.7
Telson, length	5.7
Vesicle (length/width)	3.9/2.1
depth	1.8
Aculeus, length	1.8
Pedipalp	
Humerus (length/width)	4.0/1.2
Brachium (length/width)	4.5/1.7
Chela (length/width)	7.0/2.1
depth	2.4
movable finger, length	4.2
fixed finger, length	3.1
Pectines	
teeth (left/right)	18/19

lateral keels; last sternite with one pair of smooth to slightly crenulate lateral keels; stigma small, long oval.

Metasoma: Inferior lateral keels of segments I to IV smooth to lightly crenulate (predominantly smooth); inferior median keels obsolete on segments I to IV; segment I slightly wider than long; segment II slightly longer than wide; segment III longer than fixed pedipalp finger.

Telson: Vesicle smooth and not tubercular; ventral surface abundantly covered with long conspicuous hairs; vesicle twice aculeus length.

Pedipalps: Fingers of chela with deep proximal scallop; fingers touch only at distal ends when chela closed; palm without distinct keels; palm smooth and lustrous; fixed finger shorter than metasomal segment III; movable finger shorter than carapace; movable finger longer than brachium.

Standard measurements: Table 7.

VARIATION WITHIN PARATYPES. Study of 10 paratopotypes (7 males, 3 females) indicated little significant variation from the holotype. Males varied

in total length from 19 to 40 millimeters, females varied from 18 to 23 millimeters. None of the females appeared to be mature. Pectine tooth count was 15 in females, and varied from 18 to 20 in males.

TYPE DATA AND ETYMOLOGY. The holotype and 10 paratopotypes were collected on the coastal sand dunes at Punta San Telmo, Baja California Sur, Mexico, 26 May 1969 by S. C. Williams. The holotype is permanently deposited in the California Academy of Sciences.

This subspecies is named "*transmontanus*" because of its only known geographical location on the eastern side of the Sierra de la Giganta which possibly isolates this subspecies.

RECORDS. Known only from the type locality.

LITERATURE CITED

WILLIAMS, S. C.

- 1968a. Scorpions from Northern Mexico: Five New Species of *Vejovis* from Coahuila, Mexico. Occasional Papers of the California Academy of Sciences, no. 68, pp. 1-24.
- 1968b. Methods of Sampling Scorpion Populations. Proceedings of the California Academy of Sciences, 4th ser., vol. 36, no. 8, pp. 221-230.
- 1968c. Scorpion Preservation for Taxonomic and Morphological Studies. Wasmann Journal of Biology, vol. 26, no. 1, pp. 133-136.
- 1970. Scorpion Fauna of Baja California, Mexico: Eleven new species of *Vejovis* (Scorpionida: Vejovidae). Proceedings of the California Academy of Sciences, 4th ser., vol. 37, no. 8, pp. 275-332.

